The provision of dental implants: Current practice amongst university and hospital specialists in restorative dentistry within the UK and Ireland.

J.S. Chin,[1] J. Rees,[2] L.D. Addy[3]

[1] Specialty Registrar in Restorative Dentistry, Cardiff University School of Dentistry, Heath Park, Cardiff
[2] Professor/Honorary Consultant in Restorative Dentistry, Cardiff University School of Dentistry, Heath Park, Cardiff
[3] Consultant in Restorative Dentistry, Cardiff University School of Dentistry, Heath Park, Cardiff

Correspondence to: Miss Jann Siew Chin
Email: jannsiewchin@yahoo.co.uk

In brief points

- Provides on overview of current implant practice amongst university and hospital restorative dental specialists in the United Kingdom and Ireland.
- Identifies the medical and dental factors considered the most important by respondents in patient selection for implant treatment.
- Indicates the main groups that qualify for NHS dental implant treatment.

Abstract

Objectives: To establish current implant practice amongst university and hospital restorative dental specialists in the United Kingdom (UK) and Ireland and their opinions relating to criteria for implant treatment.

Materials and Methods: An online questionnaire was distributed to 150 university and hospital restorative dental specialists in the UK and Ireland.

Results: The response rate was 27%. Twenty-nine (70%) respondents provided implant treatment, of which 76% and 100% placed and restored implants respectively. In addition, 79% worked with oral surgeons or oral and maxillofacial surgeons as part of the implant team. Hypodontia and malignancy were cited as the main groups that qualified for NHS dental implant treatment. Irradiation, smoking and bisphosphonates were considered the most important medical factors in patient selection for implant placement, while untreated periodontitis, poor oral hygiene and uncontrolled caries were the most important dental factors.

Conclusions: The majority of responding university and hospital restorative dental specialists within the UK and Ireland provide dental implant treatment and undertake a multidisciplinary approach where necessary. There is variation in the number patients treated with implants by each respondent annually. The main patient groups that receive priority for NHS dental implant treatment are malignancy and hypodontia. Otherwise, there is general agreement about the factors considered important when selecting patients for implant treatment on the NHS and align to the Royal College of Surgeons guidelines on selecting patients for the provision of dental implants.

Introduction

NHS-funded dental implants are provided in NHS secondary care settings within restorative dentistry or oral surgery (OS) or oral and maxillofacial surgery (OMFS) departments. Restorative specialists are considered ideal to lead the implant team as they provide the requisite skill mix for such a role but depending on local arrangements this may not always be possible.[1] Dental implants have become a widely accepted treatment option for the replacement of missing teeth, with reported long-term success and survival rates to be greater than 95%.[2] Tooth loss can impair oral function or aesthetics and negatively impact on the oral health-related quality of life (OHRQoL) of patients. In certain cases, studies have demonstrated that oral rehabilitation using dental implants can provide advantages and better improvements in OHRQoL over other conventional treatments.[3-5] Implant overdentures have been shown to result in better outcomes, which include patient satisfaction and improved nutritional intake in contrast to conventional dentures.[6, 7] The use of two-implant overdentures is considered the first choice standard of care for the edentulous mandible.[8] For single-tooth replacement, where a resin retained bridge is not indicated, a dental implant avoids preparation and damage of the adjacent teeth, which would otherwise be necessary for fixed conventional bridgework. Where patients have acquired or congenital maxillofacial hard or soft tissue defects e.g. head and neck cancer or cleft palate, they can often experience improved oral prosthetic rehabilitation outcomes using dental implants over traditional methods.[3, 9]

Due to demand outweighing the resources available, dental implant treatment within the NHS is often limited to specific high priority groups via locally agreed acceptance criteria.[10] Guidelines by the Royal College of Surgeons of England (RCSE) were published in 1997, and updated in 2012, to assist commissioners of clinical dental services to make an informed assessment of patients considered suitable for treatment for NHS-funded dental implants.[1] Previous data published by Butterworth *et al*. in 2001 showed a marked variation in the number of patients treated with dental implants by consultants within UK hospitals,.[11] To the authors' knowledge, since the RCSE guidelines were updated in 2012, no recent studies have re-evaluated this topic. With the growing demand for dental implants, knowledge of changing trends in implant provision amongst university and hospital specialists and their selection criteria would provide useful information to help guide future changes and developments. This survey therefore sought to determine current implant practice amongst university and hospital specialists in restorative dentistry within the UK and Ireland and their opinions relating to criteria for implant treatment.

Materials and Methods

An online questionnaire consisting of 12 questions was developed to assess current implant practice amongst university and hospital specialists in restorative dentistry within the UK and Ireland. The online questionnaire was constructed using software developed by Bristol University (Bristol Online Surveys, Bristol, UK). Both 'open' and 'closed' style questions were included.

The questionnaire was developed and pre-piloted within the Cardiff Dental School. Formatting discrepancies were identified and the survey was subsequently amended, reviewed and approved by the Cardiff Dental School Research Ethics Committee [Reference No: 1703a]

In March 2017, an email was sent to all members of Restorative Dentistry-UK (RD-UK), a group of consultant and specialists in restorative dentistry. Emails were also sent to dental hospitals in the UK and Ireland for the attention of all university and hospital specialists in restorative dentistry. This gave a sample size of 150. Participants were provided with the html link for the questionnaire together with a participant information sheet. Topics included:

- Current implant practice and practice setting
- Opinion on factors affecting patient selection for implant treatment

Reminder e-mails were sent at two and four weeks from the initial e-mail. After a 6-month reply period, the data was collated and examined. The Bristol On-line Surveys software (Bristol University) program permitted collection and analysis of the data. Descriptive statistics are reported.

Results

Completed questionnaires were received from 41 out of 150 university and hospital specialists in restorative dentistry within the UK and Ireland (27%). Twenty-nine (70%) of the total respondents indicated that they provided implant treatment. All forty-one (100%) respondents indicated that they worked in a university or hospital setting. Tables 1 and 2 show the roles of respondents and the number of years that they have served in this role.

Respondents were asked whether they had any sub-specialty. Table 3 shows the list of replies. Of note, more than one answer was permitted.

Respondents that worked in the NHS hospital setting were asked to report on the groups that qualified for dental implants. The responses are shown in Table 4. ‘Other’ groups included ‘selective special care cases’ as stated by one respondent and ‘significant failure of complete dentures’ by another respondent. Otherwise, one other respondent stated that only head and neck malignancy would qualify for dental implant treatment. Additionally, a further respondent stated that there was a ‘limited implant service for denture intolerance’.

Nineteen (66%) out of the 29 respondents that performed implant treatment, provided implant treatment within their NHS hospital or university setting only. Nine (31%) performed implant treatment both in a private and hospital or university setting, while one (3%) respondent performed implant treatment solely under private contract.

Results on the type of implant system most commonly used by respondents are shown in Table 5.

Twenty-two (76%) respondents indicated that they placed implants. When asked how many implants they placed per year, the replies are shown in Table 6.

Twenty-nine (100%) respondents indicated that they restored implants. When asked how many patients they restored implants for per year, the replies are shown in Table 7.

Twenty-three (79%) respondents stated that they worked with oral surgeons (OS) or oral and maxillofacial surgeons (OMFS) as part of the implant team. The procedures that they would ask the OS or OMFS teams to undertake were bone grafting (43%), sinus lifting (35%) and zygomatic implants (22%). When respondents were asked whether they performed any of these procedures themselves, twenty (56%) responded that they did not. Of those that did, seven (19%) undertook sinus lifting, eight (22%) bone grafting and one (3%) performed zygomatic implants. One respondent commented that they would place the bone graft whilst the OS or OMFS teams would harvest it. Another respondent indicated that they would undertake sinus lifting and bone grafting under local anesthetic without requiring the OS or OMFS teams. However, where general anaesthetic cases were concerned, these were jointly planned and carried out together with the OS or OMFS teams.

Respondents were asked to assess the level of importance of various medical and dental factors on patient selection for implant placement. The results are shown in Tables 8 and 9.

One respondent stated that they did not regard any of the above medical factors as absolute contraindications for implant placement. Other respondents indicated that bleeding disorders, alcohol dependency and poor wound healing were additional important medical factors to consider.

Respondents stated that failure of previous dental implants, oral access, denture adaptation and tolerance, angulation of adjacent teeth and patient expectations were additional important dental factors to consider. One respondent elucidated that the importance of mucosal disease was dependent on the condition. For example, they considered a flap reconstruction potentially very important as opposed to lichen planus, which was considered not important.

Discussion

An electronic survey provided a simple means of data collection and in this survey, the response rate of 27% was low despite distribution of two further reminder emails. On average, however, it is evident that online surveys generally receive a 30-40% response rate. [12,13,14] It is possible that the topic being addressed may not have been a priority to participants or an indicator of questionnaire fatigue. Methods to improve the response rate could have included the use of individual interviews, focus groups, postal or telephone questionnaires; however this was beyond the remit of the study. It is therefore accepted that interpretation of survey data should take into account the low

number of respondents and the risk of participant bias. Data from forty-one hospital-based specialists does however provide useful information on the implant provision trends and opinions on selection criteria within this group.

To the authors' knowledge, since the RCSE guidelines were updated in 2012, no recent studies have re-evaluated this topic. As such, the reasons for undertaking this survey were to determine any changing trends in current implant practice and views of university and hospital specialists in restorative dentistry in the UK and Ireland.

Seventy percent of respondents provided implant treatment and the majority worked as NHS consultants in restorative dentistry, serving 0 to 5 years in their current role. Those that provided implant treatment most commonly cited fixed and removable prosthodontics as their sub-specialty interest (36%), which can be expected given that this subject area is closely associated to work related to implant placement and restoration. Previous findings from a survey in 2001 by Butterworth *et al*. showed similar results, however a greater proportion provided implant treatment within this group compared to the previous survey (70% vs 50% in 2001).[11] Acceptance criteria for NHS-funded dental implant treatment is determined locally and based on a variety of factors such as the needs of the local population and funding availability. Hypodontia, malignancy, oro-facial trauma and cleft were the most frequently stated groups to qualify for NHS-funded dental implants. Interestingly, findings from a previous survey revealed that denture intolerance constituted the greatest caseload for implant treatment in 2001.[11] This suggests that either a decline in the demand for implant treatment has occurred in this group or more likely that there has been a shift in prioritisation of implant service delivery towards other groups.

Of the respondents that provided implant treatment, 76% placed implants whilst all respondents restored implants. Sixty-six percent performed implant treatment under the NHS hospital or university settings only, whilst 31% performed in both private and NHS hospital or university settings. The majority of respondents placed between 11-20 implants and restoring implants for 11 to 20 patients per year. Three respondents placed 90 or more implants per year, while two respondents restored implants for more than 100 patients per year. The overall findings show that there is a large variation in the number of patients treated by each respondent annually.

Straumann, Nobel Biocare and Dentsply are examples of established and well-known implant systems that have demonstrated high predictability and high survival rates with comparable outcomes.[15] Previous data in 2001 found that the Branemark system (Nobel Biocare) was the most commonly used system by restorative consultants in the UK.[11] In this survey, the results showed that Denstply (38%) and Nobel Biocare (35%) were the most commonly used implant systems. The reasons for the choice of dental implant system was not investigated in this study, however it can be assumed that factors including cost, ease in use and handling, operator preference, quality of service and predictability of the product would have influenced the respondents choice.

Where patients are missing considerable hard and soft tissues and teeth, involvement of OS and OMFS teams may be required especially if the implant treatment necessitates procedures that are outwith the scope or expertise of the restorative specialist. The concept of multidisciplinary team working is highly recommended in complex cases as advocated by several guidelines to ensure that patients receive the best implant treatment planning and management possible.[1, 16, 17] It is therefore encouraging to note that the majority of respondents (79%) worked with OS or OMFS specialties as part of the implant team. The procedures that respondents requested OS and OMFS teams to undertake were bone grafting (43%), sinus lifting (35%) and zygomatic implants (22%). Only a minority of respondents (19%) stated that they performed such procedures themselves.

Risk factors that may negatively impact on the outcome of implant treatment must be considered and discussed with patients for the purpose of obtaining informed consent and to minimise failure of treatment. The RCSE guidelines include the relevant medical, social and dental factors that should be considered prior to implant provision.[1] Respondents were asked their opinion on the relevance of such factors and their influence on patient selection for implant treatment. In relation to medical and social factors, there was strong agreement on the importance of irradiation, smoking and bisphosphonates in influencing patient selection for implants. Immunocompromised, immunosuppressed, diabetes, endocarditis and osteoporosis were considered quite important factors but not as important as those previously mentioned. Age and stress were rated as the least important of the medical factors. With regards to age, it can only be assumed that respondents were referring to the upper age limit when answering the questionnaire, as provision of implants in young patients when growth is incomplete would be considered a contraindication to implant placement.[1] The previous survey showed similar findings, however, the majority of respondents also ranked psychiatric illness as 'very important'.[11] In this survey, psychiatric illness was unintentionally omitted from the questionnaire, but based on these previous findings, it is assumed that this factor would have ranked as 'very important' too. In relation to dental factors, there was strong agreement that presence of untreated periodontitis, poor oral hygiene, uncontrolled caries and interocclusal space were important factors that would contra-indicate implant placement. Similarly, these findings were comparable to previous data.[11] Parafunction, occlusal relationship, presence of untreated endodontic lesions and mucosal disease were considered important but not as high as those previously mentioned.

In summary of the findings, it is encouraging to note that the majority of respondents undertake a multidisciplinary approach with implant treatment where necessary. There is otherwise general agreement about the factors that were considered important when selecting patients for implant treatment. The results also highlight that there is a difference in the number of implant patients treated with implants by each respondent annually. Without further information, it is difficult to ascertain the reasons for this variation, however it can be assumed that factors such as funding and clinician availability may play a role in this variation.

NHS-funded implant treatment is otherwise limited to specific groups, which is not dissimilar to the findings by Butterworth *et al*. in 2001[11] It is evident that hospitals have not increased the types of patients they treat and this is possibly as a result of limitations in the ability to deliver a more expansive service due to capacity and financial constraints. There is the concern that rising demand for implant treatment and increasing NHS funding pressures may mean that prioritisation of patient groups could become even more challenging than it already is. Realistically, it is unlikely that all groups will have access to NHS-funded implant treatment. Nevertheless, in enabling comparison of previous findings to current implant practice trends and implant selection criteria, it is hoped that the results of this survey may be useful for NHS commissioners to see that nationally, centres are applying a similar process and with this knowledge, may be able to simplify the process on a patient-by-patient basis knowing full well that they are acting similarly to all other centres in the UK and Ireland. The data may otherwise be useful to help guide future changes and developments in implant provision individually, locally or nationally for those involved in dental implant provision, particularly NHS implant provider units and university and hospital specialists in restorative dentistry.

Conclusions

The majority of responding university and hospital restorative dental specialists within the UK and Ireland provide dental implant treatment and undertake a multidisciplinary approach where necessary. There is variation in the number of patients treated by respondents annually. The main patient groups that receive priority for NHS dental implant treatment are malignancy and hypodontia, which is a change from the previously published survey in 2001 where the majority of treatment was for edentulous cases with denture intolerance. From a commissioning standpoint the priority groups being treated, mirror the guidelines from the Royal College of Surgeons of England across all the hospital and university respondents. Also, there is general agreement about the factors considered important when selecting patients for implant treatment within the NHS.

Conflicts of interest

The authors report no conflicts of interest relating to this study.

References

1. Royal College of Surgeons of England. Guidelines for Selecting Appropriate Patients to Receive Treatment with Dental Implants: Priorities for the NHS. 2012. Online information available at www.rcseng.ac.uk/-/media/files/rcs/fds/publications/implant-guidelines-20121009_final.pdf (accessed July 2018).
2. Jung RE, Zembic A, Pjetursson BE, Zwahlen M, Thoma DS. Systematic review of the survival rate and the incidence of biological, technical, and aesthetic complications of single crowns on implants reported in longitudinal studies with a mean follow-up of 5 years. Clin Oral Implants Res. 2012; **23**: 2-21.
3. Marx RE, Morales MJ. The use of implants in the reconstruction of oral cancer patients. Dent Clin North Am. 1998; **42**: 177-202.

4. Vogel R, Smith-Palmer J, Valentine W. Evaluating the health economic implications and cost-effectiveness of dental implants: a literature review. Int J Oral Maxillofac Implants. 2013; **28**: 343-56.
5. Sargozaie N, Moeintaghavi A, Shojaie H. Comparing the Quality of Life of Patients Requesting Dental Implants Before and After Implant. Open Dent J. 2017; **11**: 485-91.
6. Muller K, Morais J, Feine J. Nutritional and anthropometric analysis of edentulous patients wearing implant overdentures or conventional dentures. Braz Dent J. 2008; **19**: 145-50.
7. Morais JA, Heydecke G, Pawliuk J, Lund JP, Feine JS. The effects of mandibular two-implant overdentures on nutrition in elderly edentulous individuals. J Dent Res. 2003; **82**: 53-8.
8. Thomason JM, Kelly SA, Bendkowski A, Ellis JS. Two implant retained overdentures--a review of the literature supporting the McGill and York consensus statements. J Dent. 2012; **40**: 22-34.
9. Arcuri MR, LaVelle WE, Higuchi KW, Svec BR. Implant-supported prostheses for treatment of adults with cleft palate. J Prosthet Dent. 1994; **71**: 375-8.
10. Andrews KV, Penny JR, King PA. Are patients referred for NHS-funded dental implant treatment being selected in accordance with national guidelines and subsequently funded by their primary care trust? Ann R Coll Surg Engl. 2010; **92**: 512-4.
11. Butterworth CJ, Baxter AM, Shaw MJ, Bradnock G. The provision of dental implants in the National Health Service Hospital dental services--a national questionnaire. Br Dent J. 2001; **190**: 93-6.
12. Beddis HP, Durey KA, Chan MFWY. Survey of consultants in restorative dentistry in the UK regarding ongoing care of patients provided with dental implants. Br Dent J. 2017; **223**: 255-260.
13. Cook CH, Heath F, Thompson RL. A meta-analysis of response rates in web- or internet-based surveys. Educ Psychol Measurement 2000; **60**: 821-836.
14. Cowpe J, Barnes E, Bullock A. Skill-mix in dental teams in Wales. Vital 2013; **10**: 38-43.
15. Eckert SE, Choi YG, Sanchez AR, Koka S. Comparison of dental implant systems: quality of clinical evidence and prediction of 5-year survival. Int J Oral Maxillofac Implants. 2005; **20**: 406-15.
16 Gotfredsen K, Carlsson GE, Jokstad A, Arvidson Fyrberg K, Berge M, Bergendal B, et al. Implants and/or teeth: consensus statements and recommendations. J Oral Rehabil. 2008;**35 Suppl 1**:2-8.
17 The Faculty of General Dental Practice UK. Training standards in implant dentistry. 2016. Online information available at www.fgdp.org.uk/sites/fgdp.org.uk/files/docs/in-practice/fgdp%20implant%20training%20standards%202016.pdf (accessed July 2018).

Table 1. Roles of respondents (n=41)		
Role	Number of respondents	Percentage

NHS Consultant in Restorative Dentistry	24	59%
Professor of Restorative Dentistry	7	17%
Senior Lecturer	6	14%
Honorary Consultant in Restorative Dentistry	2	5%
Professor of Endodontology	1	2%
Reader	1	2%

Table 2. Number of years in current role (n=39)		
Years	Number of respondents	Percentage
0-5	14	36%
6-10	7	18%
11-15	7	18%
16-20	7	18%
21-25	2	5%
26+	2	5%

Table 3. Sub-specialty interest (n=41)		
Subspecialty	Number of respondents	Percentage
No sub-specialty interest	4	7%
Fixed and removable prosthodontics	22	37%
Periodontology	13	22%
Endodontics	15	25%
Trauma	2	3%
Head and neck oncology	1	2%
Pain and anxiety control	1	2%
Developmental dental abnormalities	1	2%
Toothwear management	1	2%

Table 4. Groups that qualify for dental implant treatment within the NHS (n=41)		
Group type	Number of respondents	Percentage
Hypodontia	39	95%
Malignancy	38	93%
Oro-facial trauma	35	85%
Cleft	34	83%
Denture intolerance	26	63%
Other dental developmental abnormalities (e.g. amelogenesis imperfecta)	23	56%
Gagging	14	34%
Other	2	5%

Table 5. Most commonly used implant system (n=29)		
Implant system	Number of respondents	Percentage

Dentsply	11	38%
Nobel Biocare	10	35%
Straumann	5	17%
Neoss	2	7%
Southern Dental Implants	1	3%

Table 6. Number of implants placed per year (n=22)		
Number of implants	Number of respondents	Percentage
0-10	4	18%
11-20	6	27%
21-30	0	0%
31-40	4	18%
41-50	1	5%
51-60	0	0%
61-70	2	9%
71-80	2	9%
81-90	0	0%
91-100	2	9%
101+	1	5%

Table 7. Number of patients provided with implant restorations per year (n=29)		
Number of patients	Number of respondents	Percentage
0-10	4	14%
11-20	9	31%
21-30	7	24%
31-40	5	17%
41-50	2	7%
51-60	0	0%
61-70	0	0%
71-80	0	0%
81-90	0	0%
91-100	0	0%
101+	2	7%

Table 8. Views of respondents on medical factors and their level of importance in patient selection for implant placement (n=29)			
Medical factor	Very important	Quite important	Not important
Irradiation	100%	0%	0%
Smoking	90%	10%	0%
Bisphosphonates	86%	14%	0%
Immunocompromised	45%	55%	0%
Immunosuppression	38%	59%	3%
Diabetes	17%	79%	3%

Endocarditis	14%	48%	38%
Osteoporosis	10%	69%	21%
Age	7%	24%	69%
Stress	0%	21%	79%

Table 9. Views of respondents on dental factors and their level of importance in patient selection for implant placement (n=29)

Dental factor	Very important	Quite important	Not important
Untreated periodontitis	93%	7%	0%
Poor oral hygiene	86%	14%	0%
Uncontrolled caries	79%	17%	3%
Intraocclusal space	75%	21%	3%
Parafunction	69%	31%	0%
Occlusal relationship	66%	31%	3%
Presence of untreated endodontic lesions	59%	38%	3%
Mucosal disease	38%	59%	3%